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AMSAT OSCAR 10 Continues In Limited Service

Through the diligent work of a small team of satellite controllers and engineers, additional communications service is now being provided by AO-10.

The command team has been able to switch on the transponder in its QRP mode. This should insure the satellite's battery is not depleted immediately because of a negative net power budget. The QRP mode reduces transponder output power by 3 dB.

Therefore, AO-10 is available for limited Mode B use provided uplink power is reduced to very low levels. This means QSOs will be marginal at best. Because of present perigee eclipses, it is best to avoid operation around perigee passage, say from mean anomaly 240 to 020, approximately.

FO-12 Returns To Service

JARL reports that FO-12 was turned off for 6 days from 22 November to 28 November for battery recovery. It seems likely extended operation of the mode JD digital transmitter caused deep discharge of the FO-12 battery. FO-12 operates with a negative power budget. That is, more power is consumed by the transponders than generated by the solar cells except in the most favorable situations of orbital geometry and transponder loading.

FO-12 returned to service on 29 November in Mode JA. JARL and JAMSAT continue to experiment with the new satellite in preparation for its being declared fully operational. Once it is declared operational, it is assumed a regular transponder operating schedule will be established.

The following interim schedule has been provided:

Day	Mode	Remarks
Sunday:	Mode JA	
Monday:	Mode D	Recharge; transponders off
Tuesday:	Mode JA	
Wednesday:	Mode JD	Transmitter cycles on-off at 116 minute intervals
Thursday:	Mode JA	
Friday:	Mode D	Same as Monday
Saturday:	Mode JD	Same as Wednesday

New AMSAT Organization Formed

A group in Santiago has formed a new AMSAT-affiliated organization, AMSAT Chile. The core group consists of CE3BCF, CE3KB and CE3XK. All three are professional engineers with long experience in satellite communications. Their experience dates back to Sputnik and Vanguard days according to the leaders.

AMSAT NA has welcomed the new AMSAT Chile into the fraternity of AMSAT-affiliated societies. The new group joins Brasil AMSAT and AMSAT Argentina in South America together with AMSAT Mexico and AMSAT NA in the Western Hemisphere.

There are now close to two dozen affiliated AMSAT organizations. According to a resolution of AMSAT NA's Board of Directors, it will help to organize these groups into an international coordinating body tentatively called AMSAT International. A general formative meeting of such a body is tentatively slated for Spring 1987.

Symposium Chairman Al Brinckerhoff, WB5PMR, welcomes attendees.

Symposium Proceedings Available

According to Bob Strickland, N5BRG, the official proceedings of the AMSAT Fourth Annual Space Symposium are now available from AMSAT. The proceedings contain the papers presented at this year's symposium in Dallas a few weeks ago. Bob says you can obtain the proceedings from AMSAT HQ. [Member cost is $10; non-member cost is $15]. Order direct from AMSAT. P.O. Box 27, Washington, D.C. 20044. Or call 301-589-6062.

Project OSCAR Orbital Tracking Books For 1987 Available Soon

Project OSCAR officials say they will again publish their popular orbital prediction books. The 1987 document will contain every south-to-north equator crossing time and longitude for FO-12, RS-5, RS-7, UO-9 and UO-11. Orders may be placed now for the books. A minimum donation of $10 for North America and $12 elsewhere is requested. Mail to: Project OSCAR, P.O. Box 1136, Los Altos, CA 94023-1136. The books will be mailed during the last half of December.

New Phase 3C IHU "Brassboard" Working With 32k Memory

AMSAT NA has received a significant donation of materials for the Phase 3C spacecraft. The Harris Corporation has delivered on its promise of radiation-hardened memory circuits. The donation will permit substantial improvements in the P3C Integrated Housekeeping Unit (IHU; the computer). The improvements will be in several areas. The most significant will be in radiation "hardness", memory capacity and power consumption.

Now, according to Vice President of Engineering Jan King, W3GEY, the updated IHU is up and running on the bench with the new memory. Actually, the unit is running with commercial equivalents of the rad-hard memories. But now that the design has been proven using the less expensive commercial grade parts, the final flight board can be fabricated and populated with the special Harris rad-hard memory parts. The P3C memory will fly 32k bytes compared to 16k now flying on AO-10.

The current problems with AO-10 are due to the accumulated radiation dose in its memory. The AO-10 NMOS memory is more susceptible than its CMOS cousins. The Harris CMOS parts to be flown on P3C are more than a hundred times more resistant to damage from radiation than those currently on AO-10. This should assure the problems encountered with AO-10 are not replicated on P3C when it flies next year. The radiation experienced in orbit comes mainly from cosmic rays and particles particles emitted by the sun (the solar wind) becoming trapped in the Van Allen belts by the geomagnetic field.

The completion of the brassboard during the Thanksgiving holiday was the result of a Tiger Team effort which saw Ron Dunbar, WØPN, fly to Boulder, Colorado from his home in Duluth, Minnesota, to help in the tests.

Gordon Hardman, KE3D, is spearheading the effort to rebuild the IHU. Helping Gordon are Steve Robinson, W2FPY, Andy Deskur, KA1M and Ron Dunbar, WØPN. According to the Colorado team, the new IHU will draw only 25 milliamps. This compares to 150 milliamps required by the AO-10 IHU. The difference is that the NMOS memories on AO-10 require much more power than the P3C CMOS units. As of December 6, the P3C IHU has run thousands of cycles without a single error. KE3D credits W2FPY's basic design with this achievement.

Autotrack Systems Proliferate

With FO-12 now in orbit, the stage has been set for a system which will reduce operator workload by automatically tracking the satellite. And several commercial concerns together with some enterprising homebrewers have moved onto the stage with various offerings.

Among the commercial entrants is one from Encomm in Plano, Texas. According to a recent press release, Encomm now has a unit designed to work with the Commodore 64 computer and the Kenpro KR-5400/5600A dual axis rotors. The unit, Model KR-001, is an interface between the parallel game port on the C-64 and the rotor unit. It sells for $149.95 The system runs on the AMSAT MAPTRAK program by N4HY. The software is available from the AMSAT Software Exchange. With the system operating, the antennas are automatically pointed at the selected satellite if it is above the horizon. Then it automatically follows the path of the satellite based on its predicted motion. The position and motion of the satellites are contained in the software and are part of MAPTRAK. The AMSAT Software Exchange is

Bob McGwier, N4HY, spoke on orbit options at the Dallas AGM '86.

reachable at AMSAT HQ, 301-589-6062. Encomm is reachable at 214-423-0024; Encomm, Inc, 1506 Capital, Plano, TX 75074.

Another commercial entrant comes from NH Enterprises in Mountlake Terrace, Washington. This concern offers three models suitable for use on the TS-1000, the C-64 and the VIC-20 computers. These units were formerly sold by Spectrum West. It's priced at $129.95. The software supplied uses equator crossings as inputs. While this is adequate for the low, circular orbiting satellites (e.g. FO-12), its use with elliptical orbits (e.g. AO-10, P3C) is questionable. The address for NH Enterprises is 22104 66th Avenue West, Mountlake Terrace, Washington, 98043.

Sources indicate several autotrack construction articles are in preparation. AMSAT is currently evaluating an autotrack construction article for possible inclusion in *QEX/SAT*, the joint ARRL/AMSAT technical journal.

One of the first autotrack systems used for OSCAR was installed by Bill McCaa, KØRZ, in 1980 using an Apple computer and software of his own design.

Field Operations Seeks Satellite Models

Vice President of Field Operations Mike Crisler, N4IFD, has called for volunteers to help build models of Phase 3C for the 1987 convention season. Mike says the scale models of AO-10 which have made the convention circuit for the last several years are always very popular. He is seeking to add models to the 1987 convention circuit to insure enough are available to meet the expanded coverage planned next year. Mike is especially interested in individuals with industrial experience in model making and related industrial arts. Please contact Mike Crisler, N4IFD, at 305-382-4044 or write to him at 8341 S.W. 137th Street, Miami, FL 33183.

Short Bursts

• An article describing PACSAT appears in the December issue of *Satellite Communications* magazine. Based on interviews with VITA's Gary Gariott, WA9FMQ, and AMSAT's PACSAT Manager Harold Price, NK6K, the article describes PACSAT-like experiments now being conducted with the University of Surrey's UO-11 Digital Communications Experiment (DCE). *Satellite Communications* is a trade journal published monthly by Cardiff Publishing, Englewood, Colorado.

• A series of articles elucidating Phase 3C will appear in *QEX/SAT* magazine early next year. The articles aim to familiarize users and would-be users of the new satellite with what to expect when using the four transponders, Mode B, Mode JL, RUDAK and Mode S. If you would like to participate in authoring one or more of the historic articles introducing Phase 3C, contact WA2LQQ via AMSAT NA, P.O. Box 177, Warwick, NY 10990.

• The launch of RS-9 and RS-10 is now estimated to be January, 1987.

• 4KØD is now active on an ice flow located at 82 degrees North, 167 degrees East. He is active on RS-5 and RS-7 according to European sources.

Ralph Wallio, WØRPK, AMSAT NA VP of Operations.

• RS-5 and RS-7 are now in continuous sunlight. Their eclipses ended recently. This should mean they will be on the air more regularly for a while.

• AMSAT NA will be sending explanatory postcards to *ASR* subscribers whose subscriptions were incomplete when *ASR* became AMSAT's official publication.

PC1245/46 Equations Provided

Users of the Sharp pocket computers PC1245/46 will want to use the following data provided by KG6EF to program their units for FO-12. KG6EF, Manfred Mueller, credits the information to DJ4ZC and DB2OS as translated by KE6MN/DJ0HC.

I = 50.01
O = 218.39
W = 252.26
E = 0.0011
G = 3157.1339
A = 1.2333
N = 78.18722472
Q = -3.0773
V = 2.5547

Board Meeting Minutes

[The AMSAT Board of Directors (BoD) met in Dallas 9 and 10 November. Here is a preliminary rendering of the minutes of that meeting.]

The meeting was convened at 10:21 AM on November 9, 1986 at the Dallas/Forth Worth Hilton Hotel. The following people were present during some or all of the 2 day BoD meeting: Herb Crosby, WD5EFC, Paul Bocci, K9NO, Dick Beers, WD9IIC, Bob McGwier, N4HY, Jim Eagleson, WB6JNN, Hans Van de Groenendaal, ZS6AKV, Phil Karn, KA9Q, Gerry Creager, WB5FIV, Art Feller, KB4ZJ, Ralph Wallio, WØRPK, Harry Yoneda, JA1ANG, Jan King, W3GEY, John Henry, VE2VQ, John Browning, W6SP, Vern Riportella, WA2LQQ, Andy MacAllister, WA5ZIB, Tom Clark, W3IWI, Harold Price, NK6K, John Champa, K8OCL, Larry Koziel, K8MU, Mike Crisler, N4IFD, Eric Rosenberg, WA6YBT, Lee Ruetz, WA5RDO, Gar Anderson, KØGA, Bill Tynan, W3XO, Hennie Rheeder, ZS6ALN, Keith Pugh, W5IU, Dick Daniels, W4PUJ, Martin Sweeting, G3YJO, Howard Ziserman WA3GOV and Martha Saragovitz.

I. Discussion of Phase 3 Operations Manual

With only 100 copies of the Phase 3 Operations Manual remaining, it was suggested that AMSAT revise the document and again work with Project OSCAR to publish the new edition. John Champa, K8OCL, agreed to handle this with the understanding that the revised manual will be available for the 1987 Dayton Hamvention.

II. Election of Officers

The BoD elected the following officers to serve for one year.

President	Vern Riportella, WA2LQQ
Executive VP	John Champa, K8OCL
VP Engineering	Jan King, W3GEY
VP Operations	Ralph Wallio, WØRPK
Corporate Secretary	Martha Saragovitz
Treasurer	Art Feller, KB4ZJ

The BoD approved the following additional positions beyond those required by the Bylaws:

Chairman of the Board	John Browning, W6SP
VP Manned S/C Ops	Bill Tynan, W3XO

The BoD opted to vacate the VP Special Projects position. The BoD concurred in the establishment of the new positions of VP Field Ops, VP Info Services and VP of Development. Mike Crisler, N4IFD, was appointed VP Field Ops while the other two new VP positions will be filled later.

III. Minutes of April 26, 1986 BoD meeting

The minutes of the April 26, 1986 BoD meeting were read by John Browning, W6SP, and then approved as read by the BoD.

IV. Mailing of Ballots for the BoD Elections

After a brief discussion focusing on the cost of mailing BoD election ballots First Class mail in the U.S.A., Tom Clark, W3IWI, moved to have the office staff determine the procedure so that ballots and the Annual Meeting announcement can be received by the members in a timely manner and with reduced cost. This was seconded by John Henry, VE2VQ, with the vote: 6 in favor; 1 absent.

V. Bylaws Change, the Corporate Name

A lively and lengthy discussion ensued concerning the corporate name change that was voted by the BoD at the autumn 1985 BoD meeting in Vail. At that time the BoD voted and the members subsequently approved a change of the corporate name (a Bylaws issue) from AMSAT to AMSAT NA (North America). Opinions were expressed by members of the following organizations: JAMSAT (JA1ANG), AMSAT NA (various), SA-AMSAT (ZS6AKV), AMSAT UK (G3YJO)and AMSAT NA Director John Henry, VE2VQ, speaking on behalf of Canadian AMSAT members. Harold Price, NK6K, felt that it was necessary to retain "AMSAT NA" for 2 reasons:

1) Most people view AMSAT as AMSAT USA and
2) It would facilitate formation of an international organization

John Browning, W6SP, moved to repeal last year's decision to change the corporation name from AMSAT to AMSAT NA and thus revert to the previous name, AMSAT. The vote was tied 3 to 3 with 1 abstention. The motion thus failed.

VI. Annual Meeting Site

Based on a presentation by John Champa, K8OCL, and Larry Koziel, K8MU, the BoD selected Dearborn, Michigan as the site for the 1987 Annual Meeting and the Fifth Annual Space Symposium. The meeting will again be held in conjunction with the Veterans Day weekend. Although there were 2 suggestions for the 1987 meeting site (Dearborn and Orlando), Mike Crisler, N4IFD, felt that at this time he did not have the necessary support group to help plan a meeting in Orlando. He hoped that by 1988 his team would be in place and Orlando would be selected to organize the meeting.

VII. Review of Bylaws

The BoD directed the President to form a committee to review the AMSAT Bylaws and report the findings to the BoD so that action can be taken at the Spring 1987 BoD meeting. At this time the BoD decided to uncouple the Spring BoD meeting from the Dayton Hamvention and hold it in Washington, D.C. at a date to be determined.

VIII. Archives

The BoD endorsed the idea of the Foothill Electronics Museum acting as official AMSAT-Project OSCAR archive and also required the proposers submit a written proposal specifying the plans.

IX. Independent Space Research Group

The BoD felt it needed a more detailed proposal and would thus request further details prior to any commitments being made.

X. EDSAT (Project of Richland Community College, Decatur IL)

The primary objective of this satellite program is educational. Program officials have received the Payload Accommodations Requirement from NASA and will sign the Launch Agreement in July 1987. The launch should be within 12 months of that date. It will be a deployed Shuttle GAS can launch with a life span estimated to be 1 1/2 years. It was suggested that AMSAT give EDSAT the necessary solar cells from its resources and that EDSAT coordinate frequencies with AMSAT NA. Ralph Wallio, WØRPK, will continue to act as liaison with the EDSAT program.

XI. Houston Packet Technology Satellite Experiment: PTSE aka Housat

Gerry Creager, WB5FIV, presented the Houston proposal. This includes a digipeater and store and forward AX.25 ISO Level 2 protocol. The group asked the BoD to recognize the PTSE proposal as an AMSAT sponsored project, assist in identifying fund raising sources, help coordinate frequencies and approve $4,000 - $6,500 in seed money. (Funding was held pending budget discussions).

XII. WØRPK AMSAT Bulletin Board

Ralph Wallio, WØRPK, reported that since July his bulletin board has received 2600 calls. The system as now deployed cannot grow anymore and the life expectancy is highly questionable since the hardware and software belong to another organization. Ralph indicated he had submitted a budget request for a dedicated system to replace the one he has provided AMSAT NA free of charge. It was noted by Harold Price, NK6K, that there is a presence on Compuserve with AMSAT information service and orbits. Ralph agreed to check all options for this service.

XIII. Phase 4 Program

A presentation on Phase 4 was given by Jan King, W3GEY. Some of the key issues identified were: Public Service theme; recognition of value of microwave spectrum; project sharing with other organizations; orbit considerations and cost. Jan felt that AMSAT objectives could be best served in appealing to a larger user base. There is a need to embrace advanced techniques to stimulate the engineering intellectual environment. The option of employing microwave techniques appears viable due to the availability of suitable equipment. Financing would likely require the support of other space interest groups. The cost would be between $800,000 to $1.2 million per spacecraft over a 3-4 year period. The cost of the project including the launch would be around $2 million. The BoD unanimously voted to continue the Phase 4 Study including technical feasibility and cost, ways and means, and application/operations related to the theme of Public Service. The study will be complete for the 1987 Annual Meeting.

XIV. Budget 1987

The BoD voted in favor of using the Treasurer's 1987 gross estimate of $215,000 income as a guideline for the finalization of the 1987 operating budget. In addition, henceforth, budgets will be reviewed and updated as required semi-annually. Tom Clark, W3IWI, moved that the BoD remain in session and later meet in camera by use of telecommunications to complete the approval of the budget. This passed unanimously.

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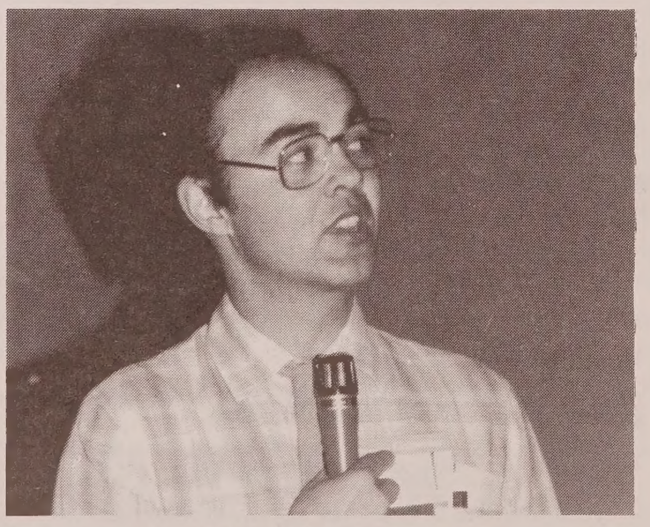

Martin Sweeting, G3YJO, of the University of Surrey, England Dallas AGM '86.

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